Unit III - Systems of Linear Differential Equations:

Systems of first order equations, Existence and uniqueness theorem. The fundamental matrix, Non-homogeneous linear systems, Linear systems with periodic coefficients.

(10 Hours)

Unit IV - Existence and Uniqueness of solutions:

Equations of the form $x' = f(t, x)$, Method of successive approximation, Lipschitz condition, Picard's theorem, Non uniqueness of solutions, Continuation of solutions.

(8 Hours)

References

[1] S. G. Deo and V. Raghavendra, *Ordinary Differential Equations and Stability Theory*, Tata McGraw Hill, 1980.

[2] A. Coddington, *An Introduction to Ordinary Differential Equations*, Prentice Hall of India, 2013.

[3] A. Coddington and N. Levinson, *Theory of Ordinary Differential Equations*, Krieger, 1984.

[4] M. W. Hirsh and S. Smale, *Differential Equations, Dynamical Systems and Linear Algebra*, Academic Press, New York, 1974. 5. V. I. Arnold, Ordinary Differential Equations, MIT Press, Cambridge, 1981.

[5] Shepley L. Ross, *Differential Equations*, Wiley, 2004.

MTL 457	Lab - 2	2 Credits (2 hours lab /week)

Practicals for II Semester

Mathematics practicals with Free and Open Source Software (FOSS) tools for computer programs

Course Outcome/Specific Outcome: Students will have the knowledge and skills to implement the programmes listed below in the Scilab programming language. They can be expected to apply these programming skills of computation in science and Engineering.

1) Program to find solution to a system of linear equations by matrix inversion method (check for all conditions on input matrix).

2) Program to find solution to a system of linear equations by Cramer's rule (check for all conditions on input matrix).

3) Program to find area of one of the geometric figures (circle, triangle, rectangle and square) using switch statements.

4) Program to implement Newton Gregory Forward Difference method.

5) Program to implement Lagrange interpolation polynomial.

6) Program to find the value of a function by using Hermite interpolation method.

7) Program to plot a neat labeled graph of elementary functions on the same plane.

8) Program to obtain the graph of plane curves - cycloid and astroid in separate figure on a single run.

9) Program to obtain a neat labeled graph of space curves - elliptical helix and circular helix in separate figure on a single run.

10) Program to obtain a neat labeled graph of surfaces - elliptic paraboloid and hyperbolic paraboloid in separate figure on a single run.

11) Program to animate the plotted curves.

12) Program to find extreme values of functions of a single variable.

Note: The above list may be changed annually with the approval of the PG BOS in Mathematics.